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EXAMINER

MATIN, NURUL M

ART UNIT

PAPER NUMBER

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SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 10/500,633	Applicant(s) HOTTINEN ET AL.	
	Examiner Nurul M. Matin	Art Unit 2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 July 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 31-60 is/are pending in the application.
- 4a) Of the above claim(s) 61-72 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 31-60 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>12/12/2006</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of group I, claims 31-60 in the reply filed on December 12, 2006.
2. Claims 61-72 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected group II(claims 61-72), there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on December 12, 2006.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.
2. Claim 39 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 39 failed to describe the average symbol rate and how the symbol rate of the transmission matrix is the same as the average symbol rate of the orthogonal code matrices.

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Claim 40 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 39 failed to describe the average symbol rate and how the symbol rate of the transmission matrix is the same as the average symbol rate of the orthogonal code matrices. Claim 40 failed to describe about the T Substantially orthogonal signaling resources and also failed to discuss about the T complex.

Claim 42 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 42 failed to disclose the rotation unit and what rotation unit does.

Re claims 43-45, which are dependent on claim 42.

Therefore, claims 43-45 has been analyzed and rejected with respect to claim 42.

Re claims 46-48, which are dependent on claim 40.

Therefore, claims 46-48 has been analyzed and rejected with respect to claim 40.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

4. **Claim 31 is rejected under 35 U.S.C. 102(a) as being anticipated by Marzetta, US 6307882.**

Re claim 31, Marzetta teaches that a method of transmitting complex symbols using a transmission code matrix, said method comprising: constructing said transmission code matrix, wherein each of said complex symbols forms part of at least two elements of said transmission code matrix and wherein at least some of said matrix elements are formed by linearly mixing at least two of said complex symbols (fig.1 & 2, col. 2, line 9-22, "According to the invention, a method of determining channel propagation characteristics in a wireless communication system wherein a number of signal communication channels are defined between a first number of transmit antenna elements associated with a system transmitter and a second number of receive antenna elements associated with a system receiver, includes selecting a matrix of training signals for transmission from the transmit antenna elements, providing information concerning the selected matrix of training signals to the system receiver, and transmitting the matrix of training signals from the transmit antenna elements to the

receive antenna elements in a determined sequence during a defined training signal time interval ; and transmitting said transmission code matrix, at least partially in parallel(fig. 2), using substantially orthogonal signaling resources(col. 5, line 54-59, "the time-dependent training signals that are fed into the M transmit antenna elements are mutually orthogonal over the time interval $[t=1,2, \dots, T]$, and they have equal energies over this same time interval" and at least three different transmit antenna paths(fig. 1).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. **Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Marzetta, US 6307882 and in view of Balakrishnan et al, US 6925131.**

Re claim 32, Marzetta fails to disclose wherein constructing said transmission code matrix comprises: converting a stream of complex symbols to at least two at least partially different streams of complex symbols; modulating said at least two streams of complex symbols to form at least two code matrices, at least one of which is of dimension greater than one; transforming said code matrices using linear transformations, to construct at least two transformed transmit diversity code matrices;

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and transmit diversity code matrices. However, Balakrishnan does (col.3, line 60-65 & col. 4, line 11-16, "In system 100, primitive data stream 115--the bits to be transmitted--is supplied to transmitter 120 where primitive data stream 115 is divided into a plurality of sub-streams 125-1, 125-2, and 125-3 typically by demultiplexing the primitive data stream in demultiplexer 130 into the plurality of sub-streams; the primitive data stream is divided into sub-streams, the data burst includes a plurality of sub-streams, with each sub-stream representing different bits than the other sub-streams of the plurality of sub-streams. As described above, at a particular time at least two of the sub-streams are transmitted over different respective antennas.

Therefore, taking the combined teaching of Marzetta and Balakrishnan et al. as a whole, it would have been obvious to one of ordinary skill in the art to incorporate the arrangement of converting a stream of complex symbols to at least two at least partially different streams of complex symbols; modulating said at least two streams of complex symbols to form at least two code matrices, at least one of which is of dimension greater than one; transforming said code matrices using linear transformations, to construct at least two transformed transmit diversity code matrices; and transmit diversity code matrices as thought in Balakrishnan into Marzetta for sub-stream to transmit over a different transmit antenna(col. 4, line 1-7).

Re claim 33, This is an obvious to one of ordinary skill in the art to know that linear transformation is different from an identity transformation because linear

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transformation is a function between two vector spaces and identity transformation is a function which does not have any effect.

Re claim 34, Marzetta and Balakrishnan references discloses the method of claim 32, and Marzetta reference also teaching wherein the at least two code matrices are orthogonal code matrices (col. 6, line 13-14 & 22-25, "Yet another example of orthogonal signals are columns from a $T \times T$ discrete Fourier transform matrix & Another advantage of using orthogonal training signals (e.g., signals that satisfy Eq. 9) is that no matrix inversion is required to implement the estimator of Eq. 5).

Re claim 35, Marzetta and Balakrishnan references discloses the method of claim 32, and Marzetta reference also teaches both the matrix dimensions of the transmission code matrix are greater than the corresponding matrix dimensions of the transformed transmit diversity code matrices (col.5, line 1-7).

Re claim 36, Marzetta and Balakrishnan references discloses the method of claim 35, and Marzetta reference also teaches the transmission code matrix is constructed from the transformed transmit diversity code matrices using the method of embedding a lower-dimensional matrix into a higher-dimensional one (col. 6, line 29-39).

Re claim 37, Marzetta and Balakrishnan discloses the method of claim 32, and Marzetta reference also teaches the transmission code matrix is constructed from the transformed transmit diversity code matrices using at least one of the methods of repetition, negation, conjugation, permutation, multiplying with a matrix (col.6, line 40-48).

Re claim 38, Marzetta and Balakrishnan references discloses the method of claim 32, and Marzetta reference also teaches the first transformed code matrix is constructed by summing two code matrices, and the at least the second transformed code matrix is constructed by subtracting the said two code matrices (see fig.2).

7. Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Marzetta, US 6307882 and Balakrishnan et al, US 6925131 and in view of Okanou et al, US 5701333.

Re claim 41, Marzetta and Balakrishnan failed to disclose the step of constructing the at least two streams of complex symbols contains a serial-to-parallel conversion. However, Okanou does (col. 2, line 7-14, a serial-to-parallel conversion circuit connected to the sampler).

Therefore, taking the combined teaching of Marzetta and Balakrishnan and Okanou as a whole, it would have been obvious to one of ordinary skill in the art to incorporate the arrangement of at least two streams of complex symbols contains a serial-to-parallel conversion as thought in Okanou into Marzetta and Balakrishnan for converting the sampled serial signal sequence into a plurality of parallel signals, a plurality of channel impulse response estimation circuits connected to the serial-to-parallel conversion circuit for estimating channel impulse responses with reference to the parallel signals to produce a plurality of estimated impulse response signals(col. 2, line 9-14).

Re claim 49, Marzetta and Balakrishnan references discloses the method of claim 32 and Marzetta reference also discloses at least one code matrix has a different symbol rate than another code matrix (col.7, line 25-35).

Re claim 50, Marzetta and Balakrishnan references discloses the method of claim 32, and Marzetta reference also discloses wherein at least one code matrix has different dimensions than another code matrix (col.1, line 28-34).

Re claim 51, Marzetta and Balakrishnan references discloses the method of claim 32, and Marzetta reference also discloses at least one code matrix is transmitted with different power than another code matrix (col.5, line 26-29).

7. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Marzetta, US 6307882, Balakrishnan et al, US 6925131 and in view of Rakib et al, US 6356555.

8. Re claim 52, Marzetta and Balakrishnan failed to teach the substantially orthogonal signaling resources include at least one of the following: non-overlapping time slots, different spreading codes, different OFDM sub carriers, different wavelet waveforms and different FDMA channels. However, Rakib does (col.2, line 45-53 and col. 42 line 45-48, "in CDMA systems with multiple transmitters which are physically distributed each using different spreading codes, it is possible for signals from different transmitters to arrive at the central unit at different power levels. Also, in an important class of alternative embodiments, the orthogonal encoding multiplexer 408 (and

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orthogonal multiplexer 527 in FIG. 28A) could be any encoder, which encodes each channel with a different orthogonal waveform.

Therefore, taking the combined teaching of Marzetta and Balakrishnan and Rakib as a whole, it would have been obvious to one of ordinary skill in the art to incorporate the arrangement of the substantially orthogonal signaling resources include at least one of the following: non-overlapping time slots, different spreading codes, different OFDM sub carriers, different wavelet waveforms and different FDMA channels as thought in Rakib into Marzetta and Balakrishnan to encode the various channel data samples. Each channel's data would then be multiplied by a different waveform's samples to generate new digital samples.

Re claim 53-58, which claim the same subject matter as recited in claim 31-34. Therefore, claim 53-58 has been analyzed and rejected with respect to claim 31-34.

9. Claim 59 is rejected under 35 U.S.C. 103(a) as being unpatentable over Marzetta, US 6307882 and in view of Calderbank et al, US 6661856.

Re claim 59, Marzetta fail to teach that complex symbols are four complex symbols and wherein said transmission code matrix comprises 4.times.4 elements. However, Calderbank does (equation 6 shows 4x4 matrix).

Therefore, taking the combined teaching of Marzetta and Calderbank as a whole, it would have been obvious to one of ordinary skill in the art to incorporate the arrangement of the complex symbols are four complex symbols and wherein said

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transmission code matrix comprises 4.times.4 elements as thought in Calderbank into Marzetta for existing orthogonal matrix.

Re claim 60, Marzetta and Calderbank references discloses the transmission code matrix of claim 58, and Calderbank reference also teaches complex symbols comprise a first group of four complex symbols and a second group of four complex signals, wherein said transmission code matrix comprises 4.times.4 elements, and wherein said complex symbols are linearly mixed within a respective group in said transmission code matrix (col.5, line 46-50).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nurul M. Matin whose telephone number is 571-270-1188. The examiner can normally be reached on mon-fri (7:30-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Nurul Matin

M. G.

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SUPERVISORY PATENT EXAMINER